FOUNDRY TRADE JOURNAL
Established 1902
WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

Vol. 83 Thursday, October 23, 1947 No. 1625

49, Wellington Street, London, W.C.2
'Grams : "Zacatecas, Rand, London"
'Phone : Temple Bar 3951 (Private Branch Exchange)
PUBLISHED WEEKLY : 21s. per annum (Home and Overseas)

Affairs in France

Our annual October visits to Paris to participate in the conferences organised by the Association Technique de Fonderie enable us to evaluate the general progress being attained within the French foundry industry. From the viewpoint of the organisation of the employers, the French have for many years led the world. The "Maison de Fonderie," a substantial well-appointed building at 66, rue Boissiere, is a lasting testimony to past enterprise and enthusiastic co-operation. The hall in this building is rather long and narrow, and we personally have found it in the past quite a strain to reach the back benches. However, for many years it has been the centre for the holding of the meetings of the "Association Technique," but this year, owing to the increasing interest which is being taken, it was deemed wise to transfer the meetings to the club rooms of the Old Boys' Association of the Arts and Metier Engineering Schools. The hall there will hold about 400 to 500 people and is splendidly equipped for such meetings. Nevertheless, it was filled to capacity when Dr. Bastien, the president, opened the first session.

Paris is still the capital of Europe, and this 21st annual meeting of the "Association" must have attracted some 50 or more foreign technicians, including seven from this country. The first session was devoted to mechanisation, and General Norguet, in an introductory address on the subject, gave 40 as the average number of employees in each French foundry, as against 80 in the U.S.A. Since the war finished, Government officials and the technical staff of the "Centre Technique," that is the research organisation for the French foundry industry, have been travelling the industrialised countries of the world to collect data for the modernisation of their plants. The four papers presented were logical statements of the fundamentals necessary for the task ahead. The British have fairly well covered this ground, but there was a plant described which was new to us. It was a knock-out wherein the grid was raised by cam action, and on its descent, instead of a jar, the weight was taken up by vibratory springs.

We were accorded the honour of presiding over a session of a general character. The third one was devoted to the testing of cast iron. It was opened by Dr. Everest, who gave a report on a recent British development. There was as usual a good deal of talk as to whether tests should be on separately-cast or trepanned test pieces. The French are still thinking much about shear tests, but as there is no international support for this they are very courteously agreeing "to talk the same language" as the other nations. Each year since the war the "Centre Technique" assumes greater importance in the affairs of French industry, and Mr. Le Thomas is to be congratulated upon surrounding himself with a young, enlightened and enterprising technical staff. With adequate finance, central and local research stations he is bringing technology to the smaller concerns. It is part of their policy, it seems, to give each foundry, no matter how small, a speciality, which can be made economically there, yet we counsel that for the little jobbing concerns much elasticity must be left in order that they can continue their traditional activity as a repair service for local industries. Finally we extend the grateful thanks of ourselves and colleagues for the almost overwhelming hospitality extended by our French friends. Such lavish entertainment was a great change from British austerity; this so-called "starving Europe" was for us a paradise.

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Mr. W. T. Evans Honoured

At a meeting of the Council of the Institute of British Foundrymen, held at Weston-super-Mare last Saturday, Mr. W. T. Evans, of Derby, was elected to honorary life membership of the Institute. Mr. Evans joined the Institute in 1918. By 1921 he was elected president of the East Midlands branch, and at that period was particularly active. He read Papers on the manufacture of motor cylinders and on foundry practice. At that time he was foundry manager to A. Handysides & Company, Limited, of Derby, makers of automobile engine castings. Later he joined Ley's Malleable Castings Company, Limited, and at the time of his resignation last year, was works manager. He presided for a second time over the Branch a few years ago, but the feature of Mr. Evans' career, which is most appreciated, is the continuity of his enthusiastic participation in the affairs of the Branch and the Institute over such a long period.

A Mobile Laboratory

A mobile laboratory and office designed for "field" operation in iron and steel works has been built by the Steelmaking Division of the British Iron and Steel Research Association. Mounted on a 3-ton ex-army truck (formerly a telecommunications van) a box body contains the laboratory instruments, and can be lifted off the chassis by crane and transported to otherwise inaccessible parts of the works.

Since various combinations of instruments may be wanted in different circumstances, each item is mounted separately in a light-weight panel and assembled on a frame to form a standard unit. Two standard frame sizes are used to provide further flexibility, one being half the size of the other. The removable body is fitted in addition with small laboratory and workshop benches, writing table, cupboards, field telephones, lighting and air conditioning. Thus it can also be used as a central office for works trials.

The actual instruments comprising the equipment are:—Ring balance flow meters of various ranges; indicating and recording potentiometers; indicating and recording millivoltmeters; total radiation pyrometers; thermocouples; gas analysis apparatus; CO_2 recorders; pressure recorders, and immersion pyrometer for liquid steel temperatures.

The outfit has been designed by Dr. A. H. Leckie, deputy head of the Steelmaking Division, and Mr. E. Rogers, officer in charge of instruments for the Division, and was assembled at the Association's physics laboratories, Battersea. It will be used in works trials throughout the country. Works' staff interested in making use of the equipment are invited to contact Dr. Leckie at the Association's headquarters, 11, Park Lane, London, W.1, as although a full initial programme has been arranged, the nature of the work to be undertaken at a later date, and possible further extensions, will be substantially affected by the industry's own requirements.

Forthcoming Events

(Secretaries are invited to send in notices of meetings, etc., for inclusion in this column.)

OCTOBER 29.

Institute of British Foundrymen.

London Branch:—"The Production of Cast Crankshafts," by R. B. Templeton, at the Waldorf Hotel, Aldwych, London, W.C.2, at 7.30 p.m.

Institution of Works Managers.

London Branch:—"Meeting the Industrial Power Crisis," by C. T. Melling, at the Waldorf Hotel, Aldwych, London, W.C.2, at 6.30 p.m.

OCTOBER 30.

The Institute of Vitreous Enamellers.

Midlands Section:—Meeting originally arranged for October 9 will be held at the Grand Hotel, Birmingham, at 7 p.m.

OCTOBER 31.

Institute of British Foundrymen.

Scottish Branch—Falkirk Section:—"The Protection of Metals Against Corrosion," by W. Westwood, B.Sc., and R. I. Higgins, at the Temperance Café, Lint Rigg, Falkirk, at 7 p.m.

The Institution of Mechanical Engineers.

Discussion on the Manufacture of Turbine Blades for the Whittle Engine, by T. A. Kestell, A.M.I.Mech.E., at Storey's Gate, St. James's Park, London, S.W.1.

Institute of Metals.

Sheffield Section:—"Electroplating Problems," by A. W. Hothersall, M.Sc.Tech., at the Mining Lecture Theatre, Dept., of Applied Science, The University, Sheffield, at 7.30 p.m.

NOVEMBER 1.

The Institute of British Foundrymen.

Wales and Monmouth Branch:—Visit to the foundry of Guest Keen & Baldwins, Limited, Dowlais. 'Bus from Cardiff at 1.30 p.m., calling at Pontypridd 2 p.m.

German Industry Reports

The B.I.O.S., Information Section, of 37, Bryanston Square, London, W.1, announce the publication of B.I.O.S. 1423, "The Application of Aluminium and Its Alloys in Germany." It costs 5s. 8d., post free. A second document, of interest to the makers of builders' castings, is I.I.O.A. 49, "Some Documents and Catalogues of German Coal-fired Heating and Cooking Stoves manufactured during and just before the War." This one costs 1s. 1d., post free.

Parcels from Australia

It was announced at the opening meeting of the London Branch of the Institute of British Foundrymen that the Institute of Australian Foundrymen were sending a hundred food parcels for distribution. Of these 16 were allotted to London and it had been decided to take, say, every fortieth member of the 160-odd on the list and make him the recipient of a parcel. This kindly action by Australian foundrymen is much appreciated by those at "home."

Mass Production Methods Applied to the Manufacture of Cast Steel Bomb Bodies*

By Percy H. Wilson, O.B.E., M.I.Mech.E.

Synopsis

Factors leading to the construction of a new plant are outlined. A detailed description of the melting process is included, and the paper records the first instance of the successful production of steel in side-blown converters from metal consisting entirely of cupola melted steel scrap.

A highly mechanised steel foundry for the mass production of 500-lb. bomb bodies in green sand moulds is described, the various operations of sand handling, coremaking in specially designed machines, moulding by Sandslingers, stripping, cooling, fettling, testing, heat treatment, shot blasting, and internal grinding being integrated to give a steady production of 100 castings per hour.

During the first few months of the war it became apparent that the tonnage of bombs which would be required by the combined air forces was very much greater than the potential capacity of the then existing steel foundries and other works capable of producing bomb bodies.

The Ministries concerned therefore approached various manufacturers with the object of setting up suitable shadow factories solely for the purpose of producing steel bomb bodies. One of these plants was that built within the works of the Stanton Ironworks Company, Limited, and known as the Stanton Gate Foundry, which, as the war progressed, became the largest single source of supply of 500 lb. cast steel bomb bodies. The general layout of the steel melting plant is shown in Fig. 1.

This plant was designed jointly by the Stanton Ironworks Company, Limited, and H. A. Brassert & Company, Limited, the former being responsible for the design of the principal production unit, *i.e.*, the foundry, whilst the latter dealt with the melting and machine shops.

It was decided that the factory should be capable of a continuous production of bomb bodies at the nominal rate of 100 per hour and in its design certain important factors, due to conditions imposed by war, had to be considered. At the outset it was realised that the type of male labour usually employed in steel foundries would be in short supply. In consequence, all possible operations were mechanised, and wherever practicable, the plant was designed so as to be capable of operation by female labour.

The raw materials supply position had also to be considered as, due to the shipping position, it was necessary to limit the imports of hematite iron and ferro alloys. The layout of the steel plant and the steel making process adopted, was arranged so as to minimise the use of these materials, and after the plant had been in operation a few months, the use of hematite iron was, in fact, entirely discontinued, and the consumption of ferro silicon in the cupolas and in metal charged into the converters was reduced to a figure not exceeding one quarter of one per cent. in the cupolas and about half this amount in the converters.

* Paper presented by the President of the Institute of British Foundrymen at the Nottingham Conference.

Production of Steel

The steel-making plant and equipment were housed in two adjacent bays each 510 ft. long × 147 ft. wide, one of which contained:—(*a*) Four cupolas and blowers; (*b*) two 12-ton rotary furnaces with ancillary pulverised fuel equipment, and (*c*) four 3-ton side-blown acid lined converters with separate blowers, together with storage space for bricks and other refractory materials and pits to accommodate the rotary furnace shells and converter bodies during relining. The second bay was used exclusively for the storage and preparation of raw materials, and cupola charging equipment.

The steel-making process was a definite departure from previously recognised practice, and its adoption in this foundry provided the first instance of the use of this process on a commercial scale. In principle, the process consisted of the melting and recarburising of selected steel scrap in cupolas, the desulphurisation of the melted metal by treatment with soda ash, followed by the superheating of the metal in rotary furnaces and the direct conversion to steel of the low silicon metal in side blown Tropenas converters.

The following paragraphs describe in some detail the type of plant used, and the methods adopted for the production of molten steel of the requisite composition for the casting of the steel bomb bodies.

Raw Material Preparation

The steel scrap consisted of rails, girders, drop forging scrap, billets, crop ends, stampings and scrap shells which were used with a proportion of circulating scrap consisting of heads, runners and scrap bombs. Each truck was sampled and analysed for sulphur and phosphorus before cutting to suitable sizes. The

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general basis of acceptance was phosphorus content of 0.08 per cent. maximum, but this varied with the phosphorus content of the bulk of the delivery at any one period. Some of the material contained less than 0.02 per cent. phosphorus, and it was all carefully mixed to give an average charge containing 0.05 per cent., consistent with physical condition to avoid scaffolding and loose or too close packing in the cupola. For this purpose, long rails and girders were cut to lengths of 2 ft. 6 in. by oxy-gas burners, the oxygen being piped into the scrap bay from a liquid oxygen evaporator plant. Two railway lines running the length of the raw materials bay enabled 25 wagons to be available for simultaneous unloading into the charging skips to give the desired chemical and physical charge composition for a whole shift.

Cupolas

There were four drop bottom cupolas of the balanced blast type designed to give maximum carbon pick-up to the charge. Constructional details were as follows:—

Height—tapping hole to top of stack	47 ft.
Height from tapping hole to charging sill	25 ft. 6 in.
Diameter of shell	11 ft. 3 in.
Thickness of lining	1 ft. 10½ in.
Working diameter	7 ft. 6 in.
Height from tapping hole to tuyere level	4 ft. 3 in.
Number and diameter of tuyeres	16 main × 8 in. dia. 16 auxiliary × 2½ in. dia. 8 secondary × 4 in. dia.

The charge, using 100 per cent. steel scrap, consisted of 4,000 lb. of steel scrap, 20 lb. of 45 per cent. ferro-silicon, 672 lb. of coke, and 100 lb. of limestone. The bed coke weighed 5 tons 16 cwts. The addition

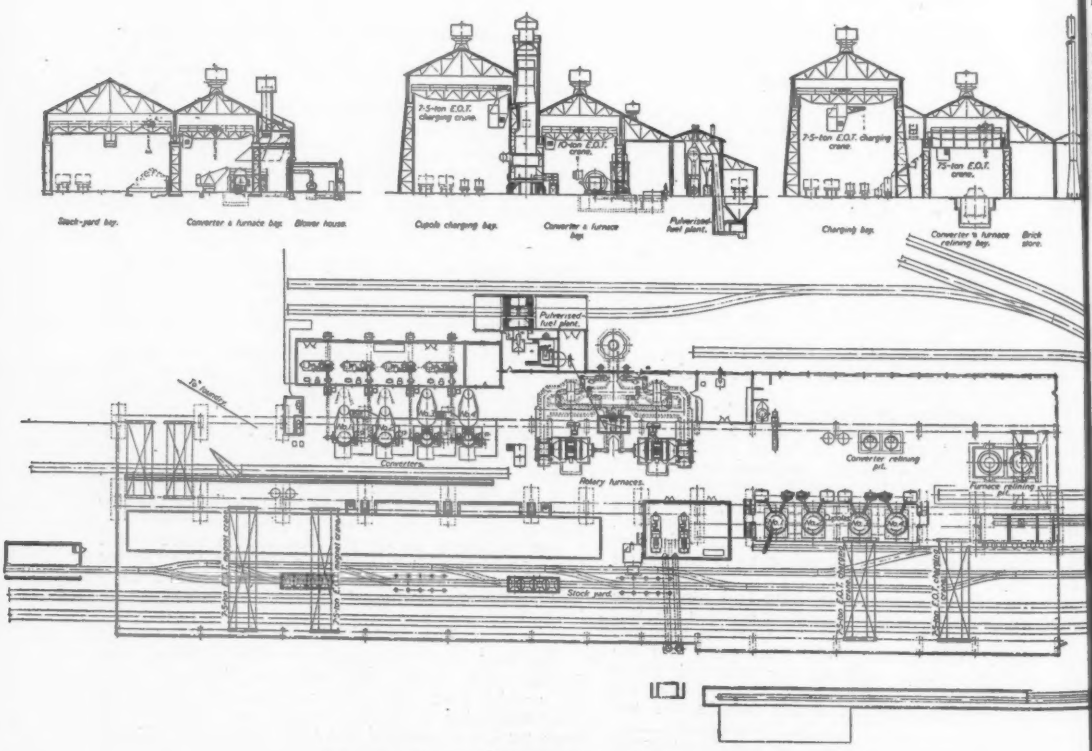

FIG. 1.—GENERAL ARRANGEMENT OF STEEL-MAKING PLANT.

of ferro-silicon was made in order to ensure fluidity of the metal tapped from the cupola, especially at the commencement of the shift. This part of the plant commenced production before the rotary furnaces were completed, and during this period the cupolas operated on a hematite/steel mixture using up to 30 per cent. of hematite, according to its silicon content. The coke ratio was adjusted accordingly, the limits being 8 metal 1 coke with the 70/30 mixture, to 6 metal 1 coke with 100 per cent. steel scrap.

The metal charge was loaded into bottom-opening skips, carried on suitable bogies, by means of a 7½-ton magnet crane in the loading bay. These were shunted by a battery operated loco to the charging bay, the weight being checked *en route* and were then picked up by an overhead travelling crane and discharged into the cupola by the opening of the drop bottom. The coke and limestone were emptied by hand from railway wagons into similar skips and charged into the cupola. Two magnet cranes and two charging cranes were necessary in order to cope with the rate of melting.

The cupolas were blown by Holmes-Connersville positive blowers, with two chambers 24 in. by 60 in., giving a maximum output of 18,000 cub. ft. per min. at 54 in. w.g. The volume of air used was between 9,000 and 12,000 cub. ft. per min., at which the melting rate was 16 tons and 22 tons per hr. respectively. During one shift an average rate of production of 123 castings per hr. was maintained throughout the shift, and during this period the average output of the cupola was 22 to 23 tons per hr.

The general scheme of working was to start the cupola at 6 p.m., and blow continuously through the night shift and the following day shift to 4 p.m., *i.e.*, 22 hours. During the week two single shifts of 11 hrs. were worked, viz., Monday day and Friday night. On three occasions immediately prior to a holiday period, the shifts were rearranged, and continuous blowing was carried out for 30 hrs. on one cupola.

Cupola Lining and Repair

The cupola lining was in two sections—an outer ring of 9 in. Stourbridge firebricks with an inner lining, 1 ft. 1½ in. thick, of 42 per cent. Al_2O_3 blocks from the base to the charging sill. Stourbridge firebrick blocks were used for the remainder of the shaft. After a single run the lining had burned back 10 in. all round, from tuyere level upwards for 2 ft. This continued upwards for a further 3 ft., with a gradual taper to 5 in. depth.

Fettling was carried out with used firebricks and ganister, an average of 38 cwt. and 60 cwt, respectively being used for each repair. This gave a total refractories consumption of 73 lb. per ton of metal melted. On double shift running the lining was mettled up to a diameter of 6 ft. 6 in., and on single shift working to 7 ft. 6 in. dia. for 4 ft. above the tuyeres, the consumption of refractories per ton of metal being of the same order for both single and double shift working.

Cupola Metal Composition

The remelted metal was very consistent in composition, and contained 3.2 per cent. total carbon, 0.3 per cent. silicon, 0.5 per cent. manganese, with sulphur and phosphorus according to the quality of coke and steel scrap. Welsh foundry coke containing 0.6 per cent. sulphur was used, and normally resulted in a sulphur content in the metal of 0.15 per cent. This coke was also particularly suitable physically for the charging and melting conditions of the cupolas, and its use was standardised early in the operation of the foundry. It was found necessary to increase the coke charge if, owing to emergencies, other brands had to be used. As these invariably had a higher sulphur content, this was reflected in the remelted metal, and on occasions, especially when accompanied by the use of consignments of poor quality scrap, the sulphur in the remelted metal rose as high as 0.30 per cent. It was always possible to deal with this by a desulphurising technique described later in the Paper. The phosphorus varied from 0.04 to 0.08 per cent., according to the steel scrap being used, but for long periods the variations were 0.04 to 0.05 per cent. Two interesting features were that the phosphorus content in the first ladle was generally 0.01 per cent. higher than in subsequent ladles, and a small reduction in phosphorus which occurred during desulphurisation.

Treatment of Cupola Metal

The remelted metal was desulphurised with sodium carbonate before further use, and in the early stages, when hematite pig and selected steel scrap constituted the cupola charge, sulphur reduction to 0.05 per cent. was easily carried out by the usual process, using 25 lb.

FIG. 2.—PORTION OF SCRAP BAY, SHOWING STEEL SCRAP PILE.

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of sodium carbonate per ton of metal. With the introduction of the rotary furnace and the use of 100 per cent. steel scrap, it became increasingly difficult to obtain low sulphur metal, and investigation had to be made into the desulphurising technique. Some improvement was obtained from the use of the "granular" as distinct from the "dense" quality of sodium carbonate, but this was not of the order required and experiments were carried out in which the method of the addition was varied.

The method finally adopted was the use of two treatment ladles. Owing to the high sulphur content of the metal, it was necessary to use 30 lb. of sodium carbonate per ton. This was fed into the first ladle (a 5-ton tilting receiver) as it was filled, the necessary amount for the treatment of 5 tons being added by the time that the ladle was half full. The whole of the contents of this ladle were then poured into the second one resulting in a further reaction between metal and slag. The slag was then removed and the metal passed on to the next stage of the process.

By this means, a sulphur reduction of 75 per cent. was obtained which relieved all anxiety on this account. Carbon, silicon and manganese were also reduced and there was a temperature decrease of 75 deg. C., but as the tapping temperature was of the order of 1,475 deg. C., this was not serious.

Cupola Ladles—Lining and Repair

The ladles used in this section comprised the cupola receivers and the transfer ladles. Several lining materials were tried and the final practice adopted was a basic lining for the former and an acid monolithic material for the latter. When the receivers were lined with Stourbridge firebricks (34 per cent. Al_2O_3) jointed with similar fireclay, the soda attack necessitated patching after 20-heats (100-tons), and the top three courses had to be replaced after 50-heats (250-tons). When 42 per cent. Al_2O_3 bricks were used, this life increased to 360-heats (1,800-tons) with patching of the joints at the end of each shift.

It was found that neither of these linings was satisfactory for the continuous run of double shift working and the use of a basic lining was therefore adopted which stood up satisfactorily to these conditions. The bottom was first covered with a layer, one inch thick, of a mixture composed of 3 parts Doloset and 1 part Dolopatch, on which was placed two courses of Dolofer squares jointed with Dolofer cement. The walls were built with Dolofer side arches, behind which was rammed one inch of the above mixture. The top was daubed with Doloset and the whole of the inside was finished with a wash of Dolofer cement. Drying was carried out by means of a small gas flame so adjusted as not to touch the brickwork. The flame was left in for three days and the receiver was then half filled with a coal fire and allowed to burn out.

At the end of the double shift run, a repaired receiver was put into use. The used one was allowed to cool, the wall surfaces cleaned of skull, etc., and daubed with the 3:1 Doloset-Dolopatch mixture. Spalling took place near the top and towards the end of its life it was repaired by the insertion of two courses of Dolofer splits to avoid the necessity for complete relining. This repair was more durable than the normal daubing. The receivers dealt with 1,900 to 2,000 tons of metal before requiring complete relining.

The transfer ladles were of 8-tons capacity and experiments were made with brick and monolithic linings. The former was of 34 per cent. Al_2O_3 Stourbridge "circles on edge." 2½ in. thick, which were daubed with a proprietary brand of plastic refractory at the end of each shift. The life between relinings was 300 heats (1,500-tons).

Soda attack occurred chiefly at the brickwork joints and monolithic linings were found necessary in order to obtain freedom from trouble during the periods of operation resulting from double shift working of the plant. These were rammed with an acid material with a wall thickness of two inches and the bottom 1½ inches thick, finished with a course of firebrick. For drying, a coke fire was made inside and allowed to burn out, the ladle being finally brought to red heat before use by placing upside down over a gas burner.

Repair consisted of cleaning off skull, etc., and facing up with plastic refractory material. The

FIG. 3.—CHARGING SIDE OF CUPOLAS, SHOWING CHARGING SHIPS.

life, before relining was necessary, depended on the amount of skulling and varied between 1,800 and 2,000 tons throughput of metal.

Rotary Furnaces

There were two 12-tons nominal capacity rotary furnaces of the Sesci type fired by pulverised anthracite produced in a plant attached to this section. The waste gases were utilised in recuperators to preheat the incoming air, the pulverised fuel being positively fed into the air main at a suitable point near the furnaces.

Each furnace was connected to two storage hoppers holding pulverised bituminous and anthracite coal respectively, and the maximum feed was 20-cwt. per hour. The air supply was from Holmes-Connnersville positive blowers with maximum output of 3,250 c.f.m. at 24 in. W.G.

Rotary Furnace Lining—Preparation and Repair.—The lining material was of the following composition and grading:—

	Per cent.		Per cent
Silica ..	87.8	Left on 8 B.S.I. sieve ..	22
Alumina ..	3.8	,, 16 ,, ,, ..	10
Iron oxide ..	3.0	,, 30 ,, ,, ..	7
Lime ..	1.6	,, 60 ,, ,, ..	10
Magnesia ..	0.6	,, 150 ,, ,, ..	20
Alkalies ..	0.2	,, 300 ,, ,, ..	11
Loss on Ignition	2.0	Less than 300 B.S.I. sieve ..	20

Fusion point, over 1700 deg. C.

The shell of the furnace was placed vertically in a suitable pit and the lining rammed in with pneumatic rammers round a sectional metal former. The water content of the material was carefully controlled at 6 to 8 per cent. The ramming operation was continuous and took 80 to 100 hrs., 40 tons of material being used. After the formers were removed, a preliminary skin drying was carried out by means of a coke-fired mould dryer. This was placed in the top of the furnace, which was still in its vertical position, and a long steel tube was connected to the outlet, reaching to the opposite end of the furnace.

After 24 hrs., the furnace was removed from the pit and placed horizontally on the rollers in its working position. A self-contained unit, comprising a horizontal gas burner with an integral blower, was then placed in position at the exit end, and heating by gas commenced. A protected thermocouple was inserted through the charging spout to within half an inch of the inside face of the lining, and the gas burner was adjusted to raise the temperature to 200 deg. C. in 24 hrs.

It was increased to 300 deg. C. in a further 24 hrs., and finally to 600 deg. C. in a further 24 hrs. After this, the pulverised fuel feed was commenced, to raise the temperature to fritting point in 6 hrs. The lining was then kept at 600 to 900 deg. C. by gas jet or pulverised fuel feed until required for use The lining wear was not excessive but at the end of each day, a frit was applied which consisted of 8 cwt. of silica sand.

FIG. 4.—FRONT SIDE OF CUPOLAS.

By careful control of raw materials, ramming, drying, operation and repair, the average life of a lining before knocking out was of the order of 10,000 tons, the best life recorded during the last eight months of operation, being no less than 16,500 tons. In the latter case, the consumption of refractories per ton of metal was 60 lb. of lining material and 6 lb. of patching.

Rotary Furnace Operation

The furnace was started up on bituminous pulverised fuel, and gradually changed over to anthracite as the temperature rose. This position was reached in 30 min., and the first metal was charged 1 hr. after starting up. All controls were centralised at an instrument panel. Indicators showed the temperature of the waste gas and incoming air, and the fuel and air feeds were shown on tachometer dials.

There were two tapping holes on the furnace, diametrically opposed, situated in the centre of the horizontal line of the barrel. They served for both filling and teeming and, with normal semi-rotational working, only one was open. In order to equalise wear, the tapping holes were periodically changed over, either during the mid-day break or at the end of the shift.

The calorific input was adjusted to raise the iron to the required temperature (1,500 deg. C. minimum) at the rate of 15 tons per hr. The fuel feed for these conditions was 11 cwt. per hr., or approximately 80 lb. per ton of iron. The corresponding air feed was 2,700 cub. ft. per min. The waste gas temperature was 700 deg. C. and in the incoming air 400 deg. C.

Operational difficulties were experienced if the air temperature rose much above 400 deg. C., and there was an arrangement to by-pass some of the waste gas direct to the chimney, in order to control this temperature. The above ratio of fuel to air resulted in the

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most efficient working and non-oxidising conditions, and a check was periodically made by diverting the fuel feed into a weighed receptacle over a timed period.

To maintain the rate of production in the foundry, it was only necessary to operate one of the rotary furnaces at any one time, and the general method of operation was first to superheat 10 tons to the required temperature. A suitable amount (55 to 70 cwts.) was then tapped out for the first converter heat and a further 5 tons poured in. From four to six batches per hour of 55 to 70 cwts. were tapped out and continually replaced in lots of 4 to 5 tons. The ladle for the superheated metal was of 4½-ton capacity, lined with firebrick.

Rotary Furnace Metal Composition and Temperature

There was very little change in the composition of the metal between charging and tapping, the chief difference being slightly lower manganese and sulphur. The temperature increment was of the order of 150 to 200 deg. C.

Ancillary Plant

The anthracite fuel was prepared in a separate plant from Welsh washed "duff." It consisted of a storage bunker below ground level, a vertical bucket conveyor to an overhead bunker, and a coal-fired hot-air dryer with fan to draw off water vapour. A second elevator delivered the dried anthracite to a 48-in. ball mill. The screening was to a nominal 100 mesh, all rejects being returned to the mill. From the mill, the fuel was fed to storage hoppers by a Fuller-Kinyon feed pump. The analysis and final grading were as follow:—

	Per cent.		Per cent.
Moisture ..	1.5	Left on 100 B.S.I. sieve ..	2
Ash	6.0	,, 200 ,, ,, ..	12
Volatile ..	11.5	Through 200 B.S.I. sieve ..	86
Sulphur ..	0.7		
Carbon ..	80·3		
Calorific-value, B.Th.U. per lb.	14,100		

FIG. 5.—ONE OF THE TWO ROTARY FURNACES.

Converters

There were four side-blown converters, each of 3 to 3½ tons capacity. In the original design they had silica brick linings throughout, but this was altered, very early in the operation of the plant, to silica brick body and monolithic lined nose. The tuyere arrangement was 6 by 1¼ in. dia., and the internal shape of the body was oval. When a vessel was re-tuyered, five of 2 in. dia. were put in to reduce to a minimum interference with the remainder of the lining.

The construction of the body lining comprised a 1-in. layer of asbestos wool between the shell and a first layer of bricks, followed by a lining of silica-brick arches 4½ in. thick and an inner lining of silica blocks. These were 15 in. thick on the tuyere side, graduating to 10 in. thick on the teeming side. The bottom was made up with firebrick squares laid flat and two courses of silica brick squares. The first course was laid flat and the inner course laid on end. All joints were made with a finely ground siliceous cement and as thin as possible.

The nose was rammed separately with pneumatic rammers round a collapsible metal former, with material of similar properties to that used in the rotary furnace lining. After the removal of the former, the lining was allowed to air-dry, and it was then skin-dried by a firebucket placed inside. It was next fitted to the body, which was removed from the lining pit and drying commenced.

A small gas pipe was inserted through the centre tuyere and the flame adjusted to raise the temperature slowly through the 300 and 600 deg. C. points, this stage being reached in a minimum of 48 hrs. The vessel was then moved to the blowing position and a fire started with wood and coal, after which coke was charged. It was allowed to burn with natural draft through the tuyeres for 10 to 12 hrs., the tuyere cover was placed in position, and a very slow blast applied for one hour. The remaining coke was emptied from the vessel and the first heat was charged.

For information on the temperature conditions of the lining during drying and blowing, thermocouples were inserted in a hole drilled in the inner 10 in. block to within 1 in. of the working face. The temperature recorded showed the following:—

(*a*) 0-300 deg. C. in 20 hrs. with gas heating.

(*b*) 300 to 600 deg. C. in a further 22 hrs. with increased flame.

(*c*) 600 to 1,000 deg. C. in further 4 hrs. with coke burning.

(*d*) 950 to 1,000 deg. C. maintained for 6 hrs.

(*e*) 1,300 deg. C. reached in 1 hr. with blast through coke fire.

The temperature dropped approximately 75 deg. C. during the period of charging the iron prior to blowing, and it rose to 1,450 deg. C. at the end of the blow. Other thermocouples at equidistant points from front to back of the 10 in. inner lining recorded proportional rises in temperature, a maximum of 400 deg. C. being shown at the end of the blow, 10 in. away from the working face.

Operation of the Converters

Eighty lb. of silica sand were first charged into the vessel, the object being the provision of an acid oxide, to combine with the large amount of iron oxide produced early in the blow. Its effect, on lining life, will be referred to later. Iron from the rotary furnace was then poured in from a ladle suspended on a crane balance.

The amount varied with the amount of lining wear, a new vessel taking 55 cwt., which increased to 75 cwt. at the end of its life. The practice of "setting the tuyeres" was carried out, the vessel being tilted back to the blowing position until the metal reached the bottom of the tuyeres. This resulted in a blowing angle of 5 to 10 deg. from the vertical. The tuyere box cover was then put in place, and blowing commenced at a volume of 3,500 to 4,000 cub. ft. per min. with 3½ to 4 lb. per sq. in. pressure.

Each converter had a separate Holmes-Connersville positive blower with a maximum output of 5,000 cub. ft. per min. at 6½ lb. per sq. in. Slight adjustments to volume and angle were made during the blow, but an effort was made to maintain, as nearly as possible, the original setting throughout. Small additions of 75 per cent. ferro-silicon were made at the beginning of the blow if the temperature of the rotary furnace metal was below normal.

The duration of the blow was 8 to 12 minutes. The vessel was then tilted forwards and the slag raked off the blown metal. Deoxidation was carried out by 4½ lb. per ton of stick aluminium, tied to a long rod which was plunged into the bath. The necessary alloying elements were then added, and the metal poured into the casting ladle and transferred by an electric jib crane to the foundry casting platform. The alloys added to a 65 cwt. heat were 110 lb. of ferro-manganese, 12 lb. of ferro-silicon, and 37 lb. silico-manganese. The percentage composition of the finished steel was as follows:—

C	0.22 to 0.25
Si	0.30 to 0.40
Mn..	1.4 to 1.6
S	0.05 max.
P	0.04 to 0.07

After heat treatment the physical tests on a 0.564 in. diameter bar were well above the A.I.D. specification of 35 tons minimum tensile and 20 per cent. minimum elongation.

Converter Lining Life and Repair

In the first weeks of operation, there was some concern with regard to the very short converter life,

FIG. 6.—ONE OF THE FOUR TROPENAS CONVERTERS.

30 heats per lining. Improvements in methods of lining, drying and repair increased this to 90 heats per lining. When the rotary furnaces were brought into use, the converter life dropped again, and it was realised that it was due to iron oxide attacking the lining in the absence of oxidised silicon from the metal charge.

To provide an acid oxide, to combine with the large quantities of iron oxide produced in the early stages of the blow, silica sand was introduced into the vessel before the liquid iron. Experiments were carried out to determine the optimum amount of sand for this addition. It was found, from chemical analysis of the slag and its viscosity, that 80 lb. of sand resulted in ideal conditions and an immediate improvement in lining life to 140 heats took place. This was subsequently increased to 250 heats per lining, but final practice was to take the vessel out of service after 200 heats, strip down the inner lining where necessary and brick up to original shape. The record life of an inner lining was 356 heats. A life of 1,500 heats was obtained before complete relining was carried out, but the vessels were re-tuyered after 100 heats.

Patching was carried out as soon as the last metal was poured from the converter. A proprietary siliceous plastic refractory was mixed to a creamy consistency and poured from a long-handled bucket on the worn parts of the teeming side. The tuyere side was similarly treated, bars being placed inside the tuyeres to act as formers. After 25 to 30 heats, the nose was patched with slightly thicker material smoothed over with a flat steel spade on a long metal rod.

(To be continued.)

A Problem of Venting

In our issue of August 28, we published a query from a Foundry Manager in the North Midlands. As the various replies came through they were sent to the enquirer with the request that he summarised them. This is what he writes:—

The Problem:—Venting hollow cast-iron rollers (see Fig. 1) having cored holes at either end of ¼-in. dia. only.

* * * * *

This query has brought in numerous replies which, when carefully studied and sifted, can be summed up as follows:—The actual moulding operation is simple and presents no difficulties, the only snag being that of getting rid of the gases from the core. It is generally agreed that the best way of doing this is by building up the core on a steel tube of, say, ½ in. O.D., with walls of ¼-in. thickness and drilling a number of small holes along the tube; these holes will allow the gases from the core sand to pass freely through the bore of the tube.

In order to bind the sand to the tube, the latter may be wound with asbestos string or thin soft iron wire, this being done on the spiral (see Fig. 2). The core sand should be of good angular or sub-angular silica sand of a grain size that will remain mostly on a 60-mesh sieve. The following mixture is suggested:—Dry sand, 5 cwts.; flour, 9 pints; paraffin, 0.25 pint; proprietary core oil, 7.5 pints, and water, 6 pints.

Opinions differ as to the best casting position, but, unless stringent pressure conditions are to be applied to the castings, they can very well be cast horizontally, two in a box, as shown in Fig. 3. Dirt can be kept out of the castings by pouring the metal through a strainer core at the bottom of the down-gate. A ridge runner should be arranged in the top half of the mould and the in-gates to the castings so arranged that the ridge is filled before the metal flows through the in-gates to the castings.

An unusual suggestion comes from a Belgian reader where the perforated tube is again recommended, this tube being extended through the top core print (the castings being poured vertically) and connected to a compressed-air jet in such a way as to place the inside of the barrel and the core under suction.

Both the enquirer and the Editor wish to thank the following for their kindness in sending suggestions:—G. W. Brown (Erith), V. Butler (West Bromwich), A. Cook (Dudley), J. Daly (Bolton), J. Gilmour (Glasgow), J. Goffart (Belgium), J. Massetti (Gibraltar), D. Roughead (London), G. Sairtees (London), and W. A. Turner (Royston).

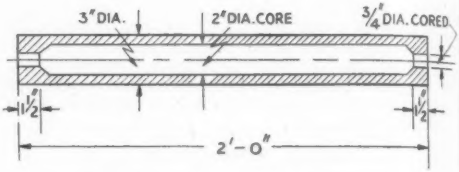


FIG. 1.— THE CASTING REQUIRED.

AT THE ANNUAL MEETING of the Belfast Association of Engineers held last night, Mr. Denis Rebbeck, M.A. M.Sc., was elected president and delivered his inaugural address. The membership of the Association has now reached 500.

FIG. 2.—CONSTRUCTION FOR THE CORE.

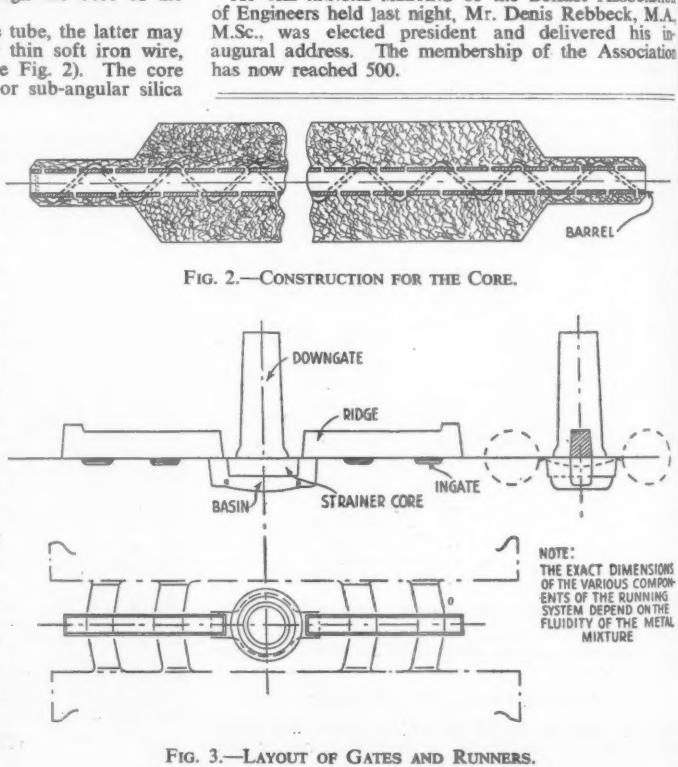


FIG. 3.—LAYOUT OF GATES AND RUNNERS.

Nottingham Discussion on

"Surface Drying of Moulds"*

By A. Cracknell and F. Cousans

INTRODUCTION

In introducing the Paper, MR. CRACKNELL said it was hoped that the results might shed some light on a subject about which so little had been written. The skin drying of moulds was developed as a means of obviating the time-consuming process of completely drying a mould, and it would be obvious that there was some stage in the skin-drying process beyond which there was no point in continuing the drying. This stage would be represented by the minimum cost of drying with respect to the most economical yield of good castings, and it was to investigate this that the work was put in hand.

It would be obvious that the limited experience gained from observation of the properties of one sand did not allow one to make assertions which would cover the whole of moulding materials practice.

There was a view widely held in both this country and in America that moisture "struck back" to the surface of a mould which had been allowed to stand after skin drying. This view was crystallised by C. W. Briggs in his latest book, "The Metallurgy of Steel Castings," in which he wrote: "If skin-dried moulds are allowed to stand for several hours after skin drying, the moisture in the backing sand will penetrate the skin-dried zone to produce a wetted area again." Moisture did strike back, but one would hardly regard sand containing 1 per cent. moisture as being "wet." Admittedly the fundamental idea of casting a mould as soon as possible after it had been skin dried was quite sound, since the properties of the surface did deteriorate with time, but it could hardly be said to be directly due to *wetting* of the sand.

A point which was overlooked when these results were originally presented, and one out of which future control developments of the process might come, was the use of chemical indicators capable of revealing the presence or absence of moisture on the surface of a mould. Some experiments along these lines were tried using cobalt nitrate and copper sulphate as indicators. Little success was obtained, as the colours developed were too faint, but crystals of copper sulphate pushed into the face of a mould which was being skin dried with hot air, gave a distinct colour change from blue to white when the surface of the mould surrounding the crystals was very nearly dry. It was hoped that this, and possibly other phenomena of a similar nature, might be developed so that they might be used to indicate the "end point" of the skin-drying process, thereby taking one element of guesswork out of the operation.

Presuming that the notes on the ageing of moulds were likely to come in for some severe criticism, he pointed out that it was fully appreciated that they might not represent the views of the members present, but they must be taken as conclusions based on a necessarily limited number of observations and not a wide experience.

Discussion

The discussion was opened by MR. D. NEWSTEAD, who said that on page 2 of the preprint, under Conclusion 4, it was stated the rate of drying over the surface of a box varied from one area to another, being slowest where the disturbance of the air was likely to be least. He did not think that point had been sufficiently appreciated. The Paper took into account the temperature of the air and the volume of the air per minute which had been applied, for the various graphs, but it never mentioned the speed of the air which hit the surface of the mould, which was of very great importance, and just as important as the temperature. The temperature and the speed really were the two factors which determined the rate of drying a surface. In Canada, cold-weather experts had set up graphs giving the figures for the cooling of human flesh by the cold and by the wind, expressed in calories given off per square metre of human flesh per hour. The graphs gave chill factors for various winds and temperature conditions. With minus 40 deg. F. and with a wind of four miles per hour, the chill factor was 1,600; with a temperature of minus 12 deg. F., a much higher temperature, and a wind of 20 miles per hour, the factor was 1,800; so the result was much the same. The temperature was much higher, but the higher speed of the wind caused the chill factor to go up to 1,800. The highest chill factor observed in 1946 was 2,600, while another month it was only 1,400, at which exposed flesh froze, so the speed of the air was of great importance in removing heat or in imparting heat. There was no doubt it had the same effect in the case of moulds, where disturbance of the air had been observed. The Authors, however, did not say in which way the air had been disturbed. Another point connected with this question was that the Authors said the temperature of air in excess of 300 deg. C. caused surface spalling of the moulds. Mr. Newstead doubted that such a temperature *per se* would cause such an effect, but with high-speed flow of air it might happen at even lower temperatures. He suggested investigations should be made in this direction, and if the Authors could give a picture sketch of their test plant, it would be possible to see what the speed had been.

It would also be very interesting to know where the temperature had been measured. Was it close to the heater, or close to the mould? Without those particulars one could not really form a picture of what had actually been done.

*Paper presented at the Nottingham Conference of the Institute of British Foundrymen, and printed in the JOURNAL, August 7, 14, and 21.

Surface Drying of Moulds

The speaker hoped that at a future date the Authors might give more graphs on those points, and perhaps show the relation to speed and temperature, and not only to the volume of warm air used over a mould.

Pressure, Volume and Spalling

MR. CRACKNELL said that Mr. Newstead was differentiating between the volume of air and the speed of the air passing over a mould surface, whereas these quantities were actually proportional to each other. Obviously, it would be a very difficult matter to measure the distribution of velocity of air over the whole of a mould surface, but the Authors could quite easily measure the total volume of air passing over the surface, and thereby control the rate of drying fairly easily. When the experiments were first put in hand, they had little guidance as to which factors would influence the process to such a degree as to require controlling. Thus they had measured those factors which they thought influenced the drying process, preliminary experiments being carried out on production moulds. Since the velocity of air could not be measured easily, and in any case, its value was not then thought to be particularly relevant, they had just measured the volume and temperature. It would be noted that these values for the drying air had been varied independently and it was as a result of these experiments that they found that they did get spalling of the mould surface with high temperatures of the air, but did not get it with high volume of air at low temperature.

They had hoped to find what volume of air at constant temperature would dry out one square ft. of mould surface in unit time. Thus it was thought that a mould with a surface area of 10 sq. ft. would require 10 times this volume of air at the same temperature to dry in the same time. The Authors, however, did not find it possible to evaluate such a quantity even when working with a flat surfaced mould, so it did not look as if there would be much possibility of calculating the volume of air required to dry a production mould which was full of air pockets, the effect of which would be well-nigh indeterminate.

In that respect he had mentioned in his introduction the use of chemical indicators, and it was on these lines that the Authors felt future development would take place. If an indicator was mixed with the mould paint which changed colour on drying, it would be possible to determine the end point of the drying process by merely looking for the change of colour of the indicator.

With regard to the place where the temperature of the hot air was measured, before any experiments were put in hand it was necessary to determine if there was any difference in temperature between the point where the air left the heating kiln to a point about 9 in. above the mould surface. This difference was found to be negligible, amounting at the most to between 5 and 10 deg. C.

MR. H. J. YOUNG said that a pleasing thing about this Paper was the youthfulness of one of its Authors. If but one-half of the younger men in the Institute would follow the example, the Institute would be more virile and the discussions more searching, vivacious and fruitful. He was unable to see that moisture "struck," either forward or backward. He presumed the Authors intended to suggest what the word "travelled" more truly described.

The rate and degree of air-drying of the surface of a green-sand mould appeared to him to be determined by the relative humidity of the surrounding air at the temperature prevailing at the time. Raising the temperature of air of *low* relative humidity would increase the rate of air-drying, while high-temperature air of high humidity would air-dry the mould surface hardly at all. In other words, air at any one temperature could dissolve only so much aqueous vapour before it became saturated; at a higher temperature it could dissolve so much more before becoming again saturated. Obviously, also, the further the air from its saturation point, the more avid it was for absorption of any moisture it contacted. The latter explained why it was necessary to arrange for constant change of air within a drying stove.

Deep-seated Moisture

The speaker thought that, as the surface dried, moisture beneath would begin to travel slowly towards the drying surface, partly by capillarity (as in the case of a wick) and partly by vaporisation. If that were true, it became necessary to consider what retarded or accelerated first, capillarity and, second, vaporisation. Perhaps the Authors would kindly explain how their research dealt with the above elementary view of the air-drying of a green-sand mould. In the case of heavy moulds and cores, there was a serious practical difficulty in knowing when they were really and truly dry. Hundreds of iron castings must have been lost every year by reason of somebody *thinking* that complete dryness had been attained when, in fact, it had not, and blowholes were found when the job was machined.

Perhaps it might be added that the Paper was peculiarly compiled and difficult to follow; also, that the Authors were possibly speaking about steelfoundry practice in particular. However, the research dealt with a subject concerning which foundrymen knew little and suffered daily from their lack of knowledge.

MR. NEWSTEAD said Mr. Cracknell had spoken of difficulties in measuring the speed of the air, but personally he thought the chief necessity in skin drying of moulds was to apply a sort of hood, which caused a distribution of the hot air as far as was practical to give a uniform speed evenly over the mould. From what Mr. Cracknell said, it appeared the Authors had only blown on to the mould from a pipe, of which he did not know the diameter, and they had not done any more than that. With that method, of course, air came out direct from the pipe, and, even if blown from a distance, the air would impinge on the mould at full speed in parts and on the extremes of the mould

at a reduced speed, and the drying there would be very different, so that the spalling which had been observed had probably occurred underneath the direct discharge from the pipe. When he himself skin-dried moulds, he provided a hood which distributed the air evenly over the whole mould. That hood was made in quite a simple way. There was a cone connecting to the pipe which came from the heater, and the lower end of the cone corresponded with the surface of the mould. The circular outlet pipe from the heater was divided into several annular rings of equal areas and the outlet of the conical hood was similarly divided into annular rings. Thus a number of cones were obtained, each passing the same amount of air and discharging it at equal speeds on to the surface of the mould. By this method the speed of air which impinged on the mould was under control and reliable graphs could be obtained which related to the speed of the air.

Another point to which he drew attention was that, considering the small size of 18 in. square standard moulds used by the Authors, the required drying time from 20 to 30 min. for ½-in. depth of full drying obtained appeared to be rather excessive. At a Huddersfield foundry moulds for 6 in. dia. high-pressure steel valves, the boxes being 24 in. by 30 in., with cavities about 8 in. deep, were regularly skin dried in less than 6 min. Some 80 half-moulds were dried on a gravity conveyor in eight working hours and the results were most satisfactory.

Mr. Cracknell said that primarily their work, besides being put in hand to try to enhance the efficiency of their own apparatus, was to determine to some extent the principles of surface drying. Mr. Newstead's remarks on the distribution of air were enlightening, and he was sure one could put his suggestion to good use, because as a result of their own experiments a new apparatus had been designed and was being installed for drying moulds.

After illustrating by a diagram the difficulties they had encountered, Mr. Cracknell said what they were trying to do was to dry the flat surface of the mould so far as possible by hot air, but after that they used a gas torch to dry out those places which the air could not reach very easily. He was very interested to hear the depth of drying obtained by Mr. Newstead's apparatus and asked if Mr. Newstead had confirmed his estimated depth of drying by the determination of a moisture gradient before and after drying.

MR. NEWSTEAD, replying in the negative, said he estimated it would be about one-eighth of an inch.

MR. CRACKNELL pointed out that he was also getting complete drying to one-eighth inch depth, but he understood Mr. Newstead to have said 2 in., and that figure had seemed excessive.

MR. NEWSTEAD thought Mr. Cracknell had misunderstood him; he had not spoken of drying to 2 in. deep. In fact, he had not given any depth of penetration. It would be about ¼ in. to ½ in. To his mind, the good conditions obtained were the even distribution of air at equal speeds and the high air temperature of 300 to 350 deg. C. The air had to be hot enough to dry out the pockets and to drive out the steam. Skin drying must be done in short times effectively over the whole mould; he did not think it was any good if a torch had also to be used. One must be sure that the whole mould surface got dry to make the process worth-while.

MR. CRACKNELL added that, unfortunately, they had been governed by the limitations of the apparatus available. They had sought an increase in the efficiency of their one apparatus when the work was put in hand, and there had been no intention of preparing a Paper. They had throughout been governed by the fairly low volumes and temperatures of the air which the apparatus was capable of delivering.

Physics of Surface Drying

MR. F. COUSANS asked if he might explain what he believed to be the physics of surface drying and the reason why spalling occurred at comparatively low temperatures. If an air stream was passed across the face of a mould, obviously water was evaporated. They could all see that on the seashore with ordinary temperatures; on a windy day, it was not many minutes after the tide had gone down, before they could see the surface of the sand dry and the sand blown away. They had found as the result of their experimental work, they did not need high temperatures to harden and dry the surface of the mould, but he thought what happened if high temperatures were used was that a baking of the surface was obtained too quickly, steam was formed just below the dried skin and then it burst through the surface of the mould and so caused spalling. The experimental work was done on painted and unpainted moulds, and in the composition of the mould paint there was included a small percentage of linseed oil. That linseed oil obviously hardened by oxidation, giving a hardened skin to the surface of the mould. In his view, that hardened surface was desirable to withstand (*a*) ferrostatic pressure, and (*b*) the surface erosion which took place when liquid steel flowed over the surface of the mould.

He would suggest there were other advantages to be obtained from the use of surface-dried moulds in so far that the main mass of the sand was still "green," and so when the mould was filled with liquid steel and freezing took place, and contraction down to room temperature proceeded, a green mould gave way to the contracting steel and the result was freedom from tears and stresses, so that there were definite advantages, in the author's opinion, in the use of surface-dried moulds.

(To be continued)

Fire Protection Association. Published by the Fire Officers' Committee, The Testing Station, Boreham Wood, Elstree, Herts.

It appears that each year this country directly loses £10,000,000's worth of assets through fire losses. Much or even most of this is preventable and the matter of major interest is that this eight-page pamphlet offers free advice to all organisations and serious individuals who care to consult the Association.

Pig-iron and Steel Production in Great Britain

The following particulars of pig-iron and steel production in Great Britain have been extracted from the Statistical Bulletin for September, 1947, issued by the British Iron and Steel Federation. Tables I, II and III give the production of pig-iron and ferro-alloys (with the number of furnaces in blast at the end of the month); output of steel ingots and castings; and deliveries of alloy and non-alloy finished steel in August. Table IV summarises the activities of the steel industry during the six months ended August, 1947.

TABLE I.—*Weekly Average Production of Pig-iron and Blast-furnace Ferro-alloys, August*, 1947. (*Thousands of Tons.*)

District.	Furnaces in blast, 30.8.47	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total
Derby, Leics., Notts, Northants, and Essex	26	—	14.4	21.8	1.1	—	37.3
Lancs. (excl. N.W. Coast), Denbigh, Flints., and Ches. / Yorkshire (incl. Sheffield, excl. N.E. Coast)	5	—	6.0	0.1	—	0.7	6.8
Lincolnshire	12	—	19.5	—	—	—	19.5
North-East Coast	24	5.5	26.9	0.5	—	1.2	34.1
Scotland	8	0.6	8.3	2.1	—	—	11.0
Staffs., Shrops., Worcs. and Warwick.	7	—	4.3	1.2	—	—	5.5
S. Wales and Monmouthshire	7	2.1	17.3	—	—	—	19.4
North-West Coast	6	13.4	—	—	—	0.2	13.6
Total	95	21.6	96.7	25.7	1.1	2.1	147.2
July, 1947 (five weeks)	91	20.0	92.6	26.9	0.8	3.2	143.5
August, 1946	98	20.8	98.4	22.5	1.3	2.3	145.3

TABLE II.—*Weekly Average Deliveries of Non-alloy and Alloy Finished Steel.* (*Thousands of Tons.*)

Product.	1946.	1947 (Eight months).	1946. August.	1947. July (Five weeks).	1947. August.
Non-alloy Steel :—					
Rails and sleepers	9.0	7.6	8.9	7.5	7.0
Plates	30.9	30.5	28.8	31.3	28.5
Other heavy products	31.9	31.3	29.9	30.2	30.5
Light rolled products (excl. wire rods)	48.9	47.9	44.2	45.9	45.6
Ferro-concrete bars	3.2	2.8	2.9	2.6	3.0
Cold-rolled strip	4.2	4.5	4.0	4.0	4.5
Bright steel bars	4.5	4.5	4.3	4.6	4.3
Sheets (incl. coated)	22.4	23.8	20.1	22.9	19.4
Tin, terne and blackplate	10.4	11.8	7.4	12.4	8.7
Tubes	14.0	12.6	12.9	11.8	12.8
Wire	11.8	10.6	10.5	9.9	9.9
Tyres, wheels and axles	3.4	3.3	2.8	3.2	2.9
Forgings	4.9	4.6	4.6	4.2	5.0
Castings	2.9	2.8	3.0	2.5	3.4
Total	202.4	198.6	179.3	193.0	185.5
Alloy Steel† :—					
Plates	0.3	—	0.1	—	—
Tubes and pipes	0.2	0.3	0.4	0.3	0.3
Bars, sheets, strip and wire	2.9	3.4	2.5	3.3	3.6
Forgings	1.6	1.5	1.4	1.6	1.8
Castings	0.6	0.6	0.6	0.4	0.6
Total	5.6	5.8	5.0	5.6	6.3
Total production*	208.0	204.4	184.3	198.6	191.8
Less Intra-industry conversion	16.4	13.4	11.4	15.5	14.2
Total U.K. deliveries	191.6	191.0	172.9	183.1	177.6
Add Deliveries of imported finished steel	—	—	—	—	—
Total finished steel	191.6	191.0	172.9	183.1	177.6

* Incl. finished steel produced in the U.K. from imported ingots and semi-finished steel. † Excludes high-speed steel.

TABLE III.—*Weekly Average Production of Steel Ingots and Castings, August*, 1947. (*Thousands of Tons.*)

District.	Open-hearth. Acid.	Open-hearth. Basic.	Bessemer.	Electric.	All other.	Total (incl. alloy steel). Ingots.	Total (incl. alloy steel). Castings.	Total ingots and castings.
Derby, Leics., Notts., Northants and Essex	—	—	(Basic) 9.0	1.0	0.2	9.8	0.4	10.2
Lancs. (excl. N.W. coast), Denbigh, Flints. and Ches. / Yorkshire (excl. N.E. Coast and Sheffield)	1.2	15.3	—	0.5	0.3	16.5	0.8	17.3
Lincolnshire	—	26.1	—	—	0.1	26.1	0.1	26.2
North-East Coast	1.4	41.2	—	0.5	0.5	42.3	1.3	43.6
Scotland	6.1	32.7	—	1.7	0.6	39.7	1.4	41.1
Staffs., Shrops., Worcs. and Warwick	—	10.3	—	0.5	0.6	10.4	1.0	11.4
S. Wales and Monmouthshire	7.0	34.8	(Basic) 4.8	0.6	0.1	47.1	0.2	47.3
Sheffield	6.8	17.3	—	6.0	0.6	29.3	1.4	30.7
North-West Coast	0.4	1.8	(Acid) 4.1	—	0.1	6.3	0.1	6.4
Total	22.9	179.5	17.9	10.8	3.1	227.5	6.7	234.2
July, 1947 (five weeks)	21.1	160.3	17.7	9.8	2.8	205.6	6.1	211.7
August, 1946	21.4	178.0	14.8	8.9	2.9	219.4	6.6	226.0

(*Continued at foot of facing page.*)

Personal

MR. J. H. BENNETTS has joined the board of Geevor Tin Mines, Limited.

MR. W. BESWICK has resigned from the board of Brown Bayley's Steel Works, Limited.

MR. W. M. ROWLAND has been appointed a director of the Morgan Crucible Company, Limited.

MR. GEOFFREY C. R. ELEY has been appointed a director of the National Gas & Oil Engine Company, Limited.

MR. E. H. STAGG, secretary of Sulzer Bros. (London), Limited, manufacturing engineers, has been appointed a director.

MR. J. M. TOOTHILL, managing director of Ferranti, Limited, Edinburgh, has accepted nomination as a member of the Scottish Advisory Council on Civil Aviation.

MR. NORMAN ILES, Director for Plant Progress to the Iron and Steel Board has gone to the United States in connection with plant to be purchased for the British iron and steel industry's development plan.

MR. HOWARD BIRD has resigned his position as director and managing director of the Consolidated Pneumatic Tool Company, Limited. MR. J. A. OWEN, a director of the company, has been appointed managing director.

MR. E. V. PEARCE is relinquishing his duties as managing director, but retaining his post as chairman, of Consolidated Tin Smelters, Limited, as from October 31. MR. G. C. PEARCE and MR. C. WAITE have been appointed joint managing directors as from November 1.

MR. JOHN H. DANIELS, secretary to the managing director of the Mercantile Dry Dock Company, Limited, Jarrow, has been nominated Conservative candidate in the Jarrow municipal elections. Mr. Daniels has been connected with the shiprepairing industry for 33 years.

MR. DOUGLAS MACNAUGHTON, a director of Macnaughton & Watson, Limited, engineers, etc., of Glasgow, has been elected Deacon-Convener of the Trades of Glasgow. He succeeds COL. WALTER MACFARLANE, of Walter Macfarlane & Company, Limited, sanitary ironfounders, etc., of Glasgow.

MR. HENRY MAIN, managing director of the Caledon Shipbuilding & Engineering Company, Limited, Dundee, who has been invited by the Government of Northern Rhodesia to sit on a commission to investigate the advancement of the African native in industry, has left for Northern Rhodesia. He expects to be away until about the end of November.

MR. JOHN MCGOVERN, who, as reported in our last issue, has resigned his seat on the Tees Conservancy Commission, has relinquished his position as deputy chairman of the Furness Shipbuilding Company, Limited, Haverton Hill-on-Tees. He was managing director of the company from its foundation in 1917 until July of last year, when he was appointed deputy chairman. Mr. McGovern is to reside in the south of England.

Wills

ATKINS, A. T., of Sheffield, steel manufacturer ... £39,018
WOOD, ERNEST, of Berkhamsted, Herts, ironfounder ... £12,085
SAUNDERS, J. T., of Reading, chartered architect and structural engineer £10,789
BREEN, J. F., of Liverpool, late managing director of the Mersey Insulation Company, Limited ... £26,136
WALSHAW, H. R B., of Scunthorpe, Lincs, blast-furnace manager with John Lysaght, Limited ... £4,568
HARTLEY, J. B., of Sutton Coldfield, formerly in charge of the engineering despatch department at the G.E.C. works, Witton £980
WRIGLEY, HENRY, of Lytham, Lancs, managing director of Kirk & Company (Blackburn), Limited, machinery manufacturers £36,815
BOOTH, F. H., of Haslemere, Liberal M.P. for Pontefract 1910-18, and a former chairman of the Yorkshire Iron & Coal Company £4,312
HARROLD, C. E., chief buyer to the Bryan Donkin Company, Limited, mechanical and gasworks plant engineers, ironfounders, of Chesterfield .. £1,146
MILLAR, JOHN, of Melksham, Wilts, secretary and a director of Spencer (Melksham), Limited, manufacturers of elevating, conveying, etc., machinery, ironfounders £9,528
WILLIAMS, C. E., of Cardiff, chairman and a managing director of John Williams & Sons (Cardiff), Limited, iron and steel stockholders, ironfounders, etc. £24,519
JARDINE, SIR ERNEST, BT., M.P., of Nottingham, governing director of John Jardine, Limited, manufacturers of power-transmission appliances, etc., and a well-known industrialist £502,340
GRIFFITHS, W. T., of Darlington, for 28 years vice-chairman of the British Sheet Steel Board, and secretary of the Darlington branch of the Associated Iron and Steel Workers' Union £1,566

PIG-IRON AND STEEL PRODUCTION IN GREAT BRITAIN (*Continued from facing page.*)

TABLE IV.—*General Summary of Pig-iron and Steel Industry.* (*Weekly Average in Thousands of Tons.*)

Period.	Iron-ore output.	Imported ore consumed.	Output of pig-iron and ferro-alloys.	Scrap used in steel-making.	Steel (incl. alloy).			Steel stocks.†
					Imports.	Output of ingots and castings.	Deliveries of finished steel.	
1938	228.1	89.2	130.0	117.9	16.2	200.0	—	—
1946	234.1	115.4	149.3	147.0	8.3	244.1	191.6	1,223.9
1947—March	172.1	111.0	123.1	117.7	12.7	196.0	179.2	983.2
April*	207.9	122.1	139.2	144.9	9.3	236.4	199.8	915.4
May	213.9	124.0	141.9	149.5	12.3	243.9	197.8	871.3
June	222.7	125.2	144.3	157.6	7.6	254.0	213.2	865.6
July*	209.7	123.6	143.5	128.9‡	7.5	211.7	183.1	855.2‡
August	206.8	127.6	147.2	137.9	5.5	234.2	177.6	817.6

* Five weeks. †Stocks at the beginning of the years and months shown. ‡ Revised.

British Blast Furnaces in the September Quarter, 1947

These tables are published through the courtesy of the British Iron and Steel Federation.

Derby, Leicester, Notts, Northants and Essex.

Name of firm	In blast September 27, making: Hematite	Forge and foundry	Basic	Total	Weekly average in blast: Sept. quarter	June quarter	Total built	Furnaces relining
Clay Cross	—	1	—	1	1	1	1	—
Ford Motor	—	1	—	1	1	1	1	—
Kettering Coal & Iron	—	1	—	1	1	1	2	1
New Cransley Iron & Steel	—	1	—	1	1	1	2	1
Renishaw Iron	—	2	—	2	2	2	2	—
Sheepbridge Coal & Iron	—	2	—	2	2	2	2	—
Stanton Ironworks: Holwell	—	3	—	3	3	3	5	1
Stanton Gate	—	4	—	4	4.8	4.1	5	1
Staveley Coal & Iron	—	4	—	4	4	3.3	4	—
Stewarts and Lloyds: Corby	—	—	4	4	4	3.2	4	—
Wellingboro' Iron	—	1	1	2	2	2	3	1
Total	—	20	5	25	25.8	23.6	31	5

Lancashire (excl. N.-W. Coast), Denbigh, Flint and Cheshire.

Brymbo Steel	—	—	1	1	0.9	1	1	—
Darwen & Mostyn	—	—	—	1*	1	1	1	—
Lancashire Steel Corp'n.	—	—	2	2	2	2	3	1
Total	—	—	3	4	3.9	4	5	1

* Producing ferro-manganese.

North-West Coast.

Barrow Hematite	2	—	—	2	2	2	4	1
Charcoal Iron	—	1	—	1	0.3	0.5	1	—
Millom & Askam	2	—	—	2	2	1.9	3	1
North Lonsdale	—	—	—	—	—	—	4	—
Workington Iron & Steel	2	—	—	2	2	2	3	1
Total	6	1	—	7	6.3	6.4	15	3

Lincolnshire.

Appleby-Frodingham	—	—	7	7	6.5	8	9	—
Lysaght, J.: Normanby Park	—	—	3	3	2.9	2.7	4	1
Thomas, R., & Baldwins: Redbourn	—	—	2	2	2	2	2	—
Total	—	—	12	12	11.4	10.7	15	1

North-East Coast.

Cargo Fleet Iron	—	—	2	2	2	2	2	—
Consett Iron	2	—	1	3	2.1	2	3	—
Dorman, Long: Acklam	—	—	3	3	3	3	4	1
Redcar	—	—	2	2	0.1	0.9	2	—
Cleveland	—	—	4	4	3.5	3	5	—
Bessemer	—	—	3	3	3	3	3	—
South Bank	—	—	—	2*	2	2	4	2
Grangetown	—	—	—	—	—	—	2	—
Gjers, Mills & Co.	2	—	—	2	2	2	5	—
Pease & Partners	2	—	—	2	2	2	3	1
Skinningrove Iron	—	—	2	2	2	2	2	—
South Durham Steel & Iron	—	—	2	2	2	1.3	3	—
Total	6	—	19	27	23.7	23.2	38	4

* Producing ferro-manganese.

Scotland.

Bairds & Scottish Steel: Gartsherrie	1	1	2	4	4	4	5	—
Carron	—	1	—	1	1	1	4	1
Colvilles	—	—	2	2	2	2	2	—
Dixon, Wm.: Govan	—	1	—	1	1	1	6	—
Total	1	3	4	8	8	8	17	1

Industrial Gas-turbine Course

An industrial gas-turbine course covering land, marine and locomotive installations, is to commence at the National Gas Turbine Establishment's school at Ladywood Works, Lutterworth, on November 10, and will last for three weeks. The course is the second of its kind, the first having been held in June last, and is intended for engineers of graduate or equivalent standard. It will cover all aspects of gas-turbine technology, including fluid and thermal dynamics, practical and theoretical testing procedure and analysis, and in addition to basic theory, there will be specialist lectures on fuel technology, combustion, components, metallurgy and allied subjects.

The National Gas Turbine Establishment is the only centre in this country where instruction is given in all aspects of the gas turbine. For over two years, courses have been given in aircraft turbines, and three industrial courses have also been held, two of them for foreigners. The foreign courses proved particularly successful. Altogether, over 600 engineers have passed through the school.

Engineers wishing to attend the course should apply for the syllabus and other details to Power Jets (Research & Development), Limited, 8, Hamilton Place, London, W.1.

HUGHES BOLCKOW SHIPBREAKING COMPANY, LIMITED, Blyth, are to break up the 1,700-ton German steamer Constantia.

Aluminium Plant & Vessel Company's Acquisition

The Aluminium Plant & Vessel Company, Limited, Wandsworth Park, London, S.W.18, have purchased the business of Paramount Alloys, Limited, Slough, and will operate it as an independent subsidiary. It is believed that Paramount Alloys, Limited, is probably the only company in the country engaged exclusively on the production of stainless-steel castings. The Aluminium Plant & Vessel Company have been developing the latest methods of producing stainless-steel castings at one of their foundries at Wandsworth, but, in future, production will be mainly concentrated at Slough. For some time the output will be taken up entirely by A.P.V.'s own requirements, but, when the equipment of the Paramount Alloy's foundry can be sufficiently extended, its facilities will be made generally available.

MR. FRED W. BAKER, chairman of the Ransome & Marles Bearing Company, Limited, said the company had more orders on hand than a year ago, when he spoke at the annual meeting recently. They were making a considerable contribution to the drive for mining plant and generating machinery, and although before the war the motor industry took half the company's output, their proportion was very much lower, although volume was much the same.

British Blast Furnaces in the September Quarter, 1947—*cont.*

Staffordshire, Shropshire, Worcestershire and Warwickshire.

Name of firm	In blast September 27, making: Hematite	Forge and foundry	Basic	Total	Weekly average in blast: Sept. quarter	June quarter	Total built	Furnaces relining
Goldendale Iron	—	1	—	1	1	0.2	2	1
Grazebrook, M. & W.	—	—	—	—	—	—	2	—
Lilleshall	—	1	—	1	1	1	2	1
Round Oak Steelworks	—	1*	—	1	1	1	3	—
Shelton Steel & Iron	—	—	2	2	2	2.2	3	1
Stewarts and Lloyds: Bilston	—	—	2	2	1.2	—	3	—
Thomas, G. & R.	—	—	—	—	—	—	2	—
Total	—	3	4	7	6.2	4.4	17	3

* Cold-blast pig-iron.

South Wales and Monmouthshire.

Guest, Keen, Baldwins: Margam and Port Talbot	—	—	2	2	2	2	3	1
Briton Ferry	—	—	—	—	—	—	1	—
Cardiff	—	—	2	2	2.9	2.9	4	1
Thomas, R., & Baldwins: Ebbw Vale	—	—	2	2	2	2	3	1
Total	—	—	6	6	6.9	6.9	11	3

Sheffield.

Park Gate Iron & Steel	—	—	1	1	1	1.8	2	—
GRAND TOTAL	13	27	54	97*	93.2	89	151	21

* Includes three making ferro-alloys.

Number of Furnaces in Blast on September 27, 1947

District	Weekly average in blast, Sept. quarter	Total in blast, Sept. 27	In blast on September 27, making: Hematite	Forge and foundry	Basic	Ferro-alloys
Derby, Leics., Notts, Northants and Essex	25.8	25	—	20	5	—
Lancs. (excl. N.-W. Coast), Denbigh, Flint and Ches.	3.9	4	—	—	3	1
Lincolnshire	11.4	12	—	—	12	—
North-East Coast	23.7	27	6	—	19	2
Scotland	8	8	1	3	4	—
Staffs., Shrops., Worcs. and Warwick	6.2	7	—	3	4	—
S. Wales and Monmouth	6.9	6	—	—	6	—
Sheffield	1	1	—	—	1	—
North-West Coast	6.3	7	6	1	—	—
Total	93.2	97	13	27	54	3

Weekly Average Number of Furnaces in Blast During the Previous Six Quarters

District	1947 June	1947 March	1946 December	1946 September	1946 June	1946 March
Derby, Leics., Notts., Northants and Essex	23.6	24.7	25.8	23.5	22.2	21.6
Lancs. (excl. N.-W. Coast), Denbigh, Flint and Ches.	4	3.9	3.0	4	4.5	5
Lincolnshire	10.7	11.6	11.8	13	12.9	12.4
North-East Coast	23.2	25.5	26	26	25.8	25
Scotland	8	10.2	10.2	10	10	10
Staffs., Shrops., Worcs. and Warwick	4.4	4.2	5.8	7.8	8	8.5
S. Wales and Monmouth	6.9	6.8	6.9	6.6	6.8	7
Sheffield	1.8	1	1	1	1.4	2
North-West Coast	6.4	6.8	6.8	5.8	6.6	7
Total	89	94.7	98.2	97.7	98.2	98.5

New Furnaces Building (7)

The following companies have furnaces in course of construction:—Cargo Fleet, 1; Clay Cross, 1; Colvilles, 1; Darwen & Mostyn, 1; Lancashire Steel Corporation, 2; Richard Thomas & Baldwins (Redbourn), 1.

News in Brief

COLEY METALS, LIMITED, metal merchants and founders, of Hounslow, are making application to the London Stock Exchange for permission to deal in issued capital of £100,000 in 2s. ordinary shares.

THE GRAHAMSTON IRON COMPANY, LIMITED, Falkirk, have installed two new self-charging furnaces in their drive for greater mechanisation in the light-castings department of their foundry. The new furnaces will ensure a large increase of molten metal to the new mechanical moulding plant.

IMPORTS OF iron and steel into Eire in June last were as follow:—Pig-iron, 45 tons, valued at £658, against nil in June, 1946; iron bars and rods, 48 tons (£1,530), against 28 tons (£932); steel bars and rods, 1,360 tons (£42,617), against 721 tons (£1,360); iron and steel squares and flats, 427 tons (£12,727), against 462 tons (£11,849).

AN AGREEMENT has been made by Mr. John Oldham, chairman and managing director of Oldham & Son, Limited, manufacturers of miners' safety lamps, etc., of Denton, Lancs, with Doran Bros., of Danbury, Connecticut, under which Oldham & Son have secured the sole manufacturing and European distribution rights for Doran hat-manufacturing machinery.

THE LARGEST PASSENGER LINER yet built at Barrow, the Orcades, of about 31,000 tons gross, was launched last week from the Vickers-Armstrongs' yard for the Orient Line. After the launch Sir Robert Micklem, chairman of Vickers-Armstrongs, Limited, announced that another ship for the Orient Company, with similar characteristics, was to be laid down on the berth vacated by the Orcades.

THE MINISTRY OF DEFENCE announces that following the Commonwealth conference on defence science held informally in June of last year, a routine meeting of Commonwealth representatives, to discuss defence science problems, will be held in London next month. Sir Henry Tizard, F.R.S., chairman of the Defence Research Policy Committee, will be chairman of the meeting, which will be attended as before by senior scientists in the Ministries concerned with defence, and by senior representatives of the fighting Services.

IN VIEW OF the reports of misunderstandings arising out of the allocations of steel to the shipbuilding industry for the last quarter of the year, the Shipbuilding Conference has issued a statement which clarifies the shipbuilders' attitude to this problem. The Conference states that, while the industry is not receiving anything like the quantity which it is capable of consuming, it recognises that it has obtained a fair share of the steel available. The feeling of the industry is that the important export nature of its work is bound to receive full recognition in its allocations of steel and other material requirements.

FOLLOWING THE RETIREMENT of Mr. L. Satchwell as chairman of the Rheostatic Company, Limited, manufacturing electrical engineers, of Slough, Mr. M. J. Gartside has been appointed chairman with a consequent reduction of administrative duties to permit him to pursue more completely the company's affairs abroad in the interests of export. Mr. T. N. Flight has been appointed vice-chairman and managing director and Mr. J. H. Stevens deputy-managing director. Recent additions to the active directorship of the company are Lady E. Barber in place of Mrs. W. D. Satchwell, who has retired, and Mr. R. W. Towers, who, after many years' experience of the sales organisation, becomes sales director. Mr. Satchwell, who founded the company 25 years ago, remains a member of the board in an advisory capacity.

IN HIS STATEMENT circulated with the annual report, Lord Dudley, chairman of Horseley Bridge & Thomas Piggott, Limited, mentions that their reconstruction scheme, commenced in the spring of 1945, has made excellent progress in spite of the shortage of materials and labour, and the new constructional shops are completed except for a few details, and are in operation. The new foundry is making slower progress, but it is hoped that it will be nearing completion a year hence. Lord Dudley says that their order-book is very full indeed and a large percentage of their contracts is for high-priority work and export. One contract alone, for the new Walsall Power Station, involving about 10,000 tons of fabricated steelwork, is valued at more than £500,000. "Steel is our life blood and any further restriction in its use for constructional work would involve us in serious difficulties," the chairman adds.

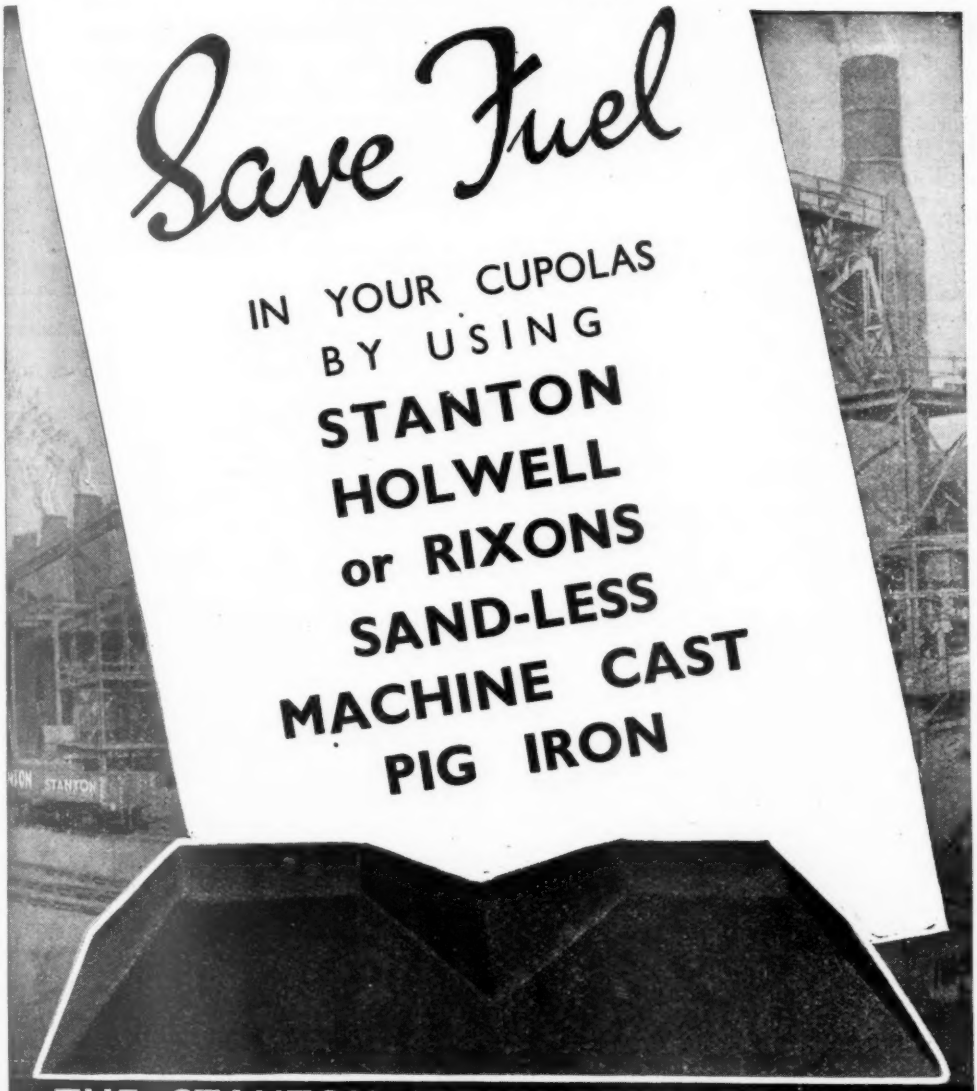
Capital of Hayden-Nilos, Limited

Arising out of the formation by the Cheviot Trust, Limited, of a syndicate to acquire the share capital of Hayden-Nilos, Limited, Mr. H. H. Berresford, managing director of the Staveley Coal & Iron Company, Limited, and a director of Doncaster Amalgamated Collieries, Limited, has become chairman of Hayden-Nilos, Limited. Mr. E. Thompson continues as managing director of the business, and new directors of the company include Mr. A. E. Whitcher and Mr. L. E. Winterbottom. The capital transaction involves over £800,000.

Hayden-Nilos, Limited, specialise in the manufacture of flexible-belt fastening machines and hooks, which are accepted as standard practice in mechanical coal conveying. The company intend to extend the production and application of their products abroad, as these markets have so far taken second place owing to home demands.

Zinc Sheet Prices Increased

The Ministry of Supply announces that the prices of zinc sheets and rolled zinc (boiler plates) were increased by 17s. 6d. a ton as from October 16, making the maximum selling price of zinc sheets £82 a ton and of boiler plates £80 a ton. The increase is to cover increased manufacturing costs. In addition, the existing premia on thin gauges and odd sizes, not covered by the Statutory Order, will be increased by 50 per cent.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Company Meeting

Powell Duffryn, Limited

The annual general meeting of Powell Duffryn, Limited, was held in London on October 22, MR. EDMUND L. HANN, chairman and managing director, presiding. The following is an extract of his statement which was circulated with the accounts:—

I have to report the appointment of Mr. Robert Foot as a managing director of Powell Duffryn and chairman of its new subsidiary company, Powell Duffryn Technical Services, Limited, which was formed in March of this year to act as consultants in connection with fuel production, distribution and utilisation. The branch of this company which handles all questions of fuel utilisation is busily engaged on behalf of some of the largest industrial concerns in this country, in helping to promote greater efficiency, and therefore greater economy, in the use of fuel of all kinds.

Your company has always been one of the foremost in the field of research. We have retained a substantial part of this side of our organisation. In the course of our research we discovered an entirely new method of producing carbon which, compared with methods now in use, possesses great advantages. The development of this process has made rapid progress. We have been able to purchase a factory at Hayes, Middx., and we have promoted a new subsidiary company—Powell Duffryn Carbon Products, Limited, with a share capital of £500,000.

The research laboratories at Battersea are being widened in scope and adapted for use as a research organisation capable of conducting original research in a wider field. The name of the research organisation has accordingly been changed to Powell Duffryn Research Laboratories, Limited.

Small Engine Factory for Scotland

Scottish Oil Engines, Limited, which has been registered in Scotland with a capital of £250,000, will manufacture internal combustion engines in a new factory, to be known as Gowkthrapple Works, which is being built at Wishaw on the site of the old Pather Iron Works. This will be leased from Scottish Industrial Estates. The directors of Scottish Oil Engines, Limited, are Mr. Alan P. Good (chairman), Hon. A. C. Geddes, Mr. R. W. Richards, Col. H. T. Thornley and Mr. A. McBain.

It is intended to manufacture at Gowkthrapple Works a series of small industrial Diesel and petrol/paraffin engines on a mass-production scale. Sales of these engines will be handled by Associated British Oil Engines, Limited. The new factory is designed to be erected in three stages each of approximately 100,000 sq. ft. of floor space.

Braithwaite & Company (Engineers)—Final dividend of 3½% (4½%), making 7½% (same).

Company News

(Figures for previous year in brackets.)

Babcock & Wilcox—Interim dividend of 5% (same).

W. G. Frith & Company—Interim dividend of 5% (same).

Enfield Cable Works—Interim dividend of 3¼% (same).

Rawlplug Company—Interim dividend of 10% (same).

William Beardmore & Company—Interim dividend of 4% (3%).

Specialloid—Final dividend of 50% (75%), making 75% (100%).

Skefko Ball Bearing Company—Interim dividend of 5%, tax free.

Cannon Iron Foundries—Final dividend of 10%, making 15% (same).

Burt, Boulton & Haywood—Second interim dividend of 5% (3%), making 7% (5%).

Leeds Fireclay Company—Net profit for the year ended June 30, after working expenses, directors' fees and debenture interest, £50,642 (£17,813, plus £12,000 from dividend equalisation account); dividend on the 6% non-cumulative participating preference shares of 8% (5%) and of 6% (nil) on the ordinary shares; deferred renewals, £10,000 (£5,000); forward, £31,175 (£15,833).

Richard Johnson, Clapham & Morris—Net trading profit for the year ended June 30, after depreciation, £86,424 (£59,363); to directors' fees, £875 (£1,000); bonus to employees, £6,000 (£4,000); taxation, £47,000 (£36,000); general reserve, £20,000 (£10,000) final dividend of 15% (11¼%), making 20% (15%) and bonus of 10% (same); participating dividend of 4% (3%) on the preference shares, making 10% (9%); forward, £6.959 (£5,879).

William Doxford & Sons—Net profit for the year ended June 30, £231,843 (£303,785); to taxation, £150,000 (£144,500); E.P.T. repayable, £50,000 (£84,500 written back from tax reserves); to general reserve, £50,000 (same); reserve for plant extensions and renewals, £20,000 (£100,000); final dividend of 10% (same) and bonus of 5% (10%), making 20% (25%); participating dividend of 1% (same) on the 5% preference shares; forward, £74,710 (£76,117).

Powell Duffryn—Trading profit for the year ended March 31, £905,924; provision for depreciation and obsolescence, £161,159; dividends from subsidiary companies and investments, £671,532; estimated amount of interim income receivable under Nationalisation Act, £100,000; to debenture interest, £88,658; debenture sinking fund, £39,492; taxation, £754,412; net profit, £633,735; transfer from reserve, £350,000; to preference dividend, £94,050; final ordinary dividend of 5%, making 8% (same) and bonus of 2% (7%); forward, £828,251 (£469,892). The report states that insertion of comparative figures would serve no useful purpose and would be misleading.

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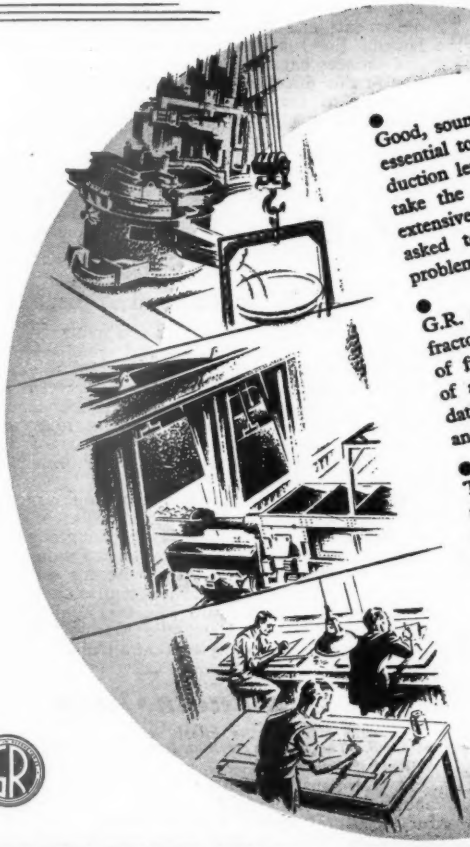

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Raw Material Markets

Iron and Steel

Demand for all types of foundry pig-iron is well maintained and furnaces are having the utmost difficulty in keeping consumers satisfied; in fact, in some cases, it is impossible for furnaces to meet all licensed quantities. This is making things most difficult for the light-foundry industry, owing to the fact that high-phosphorus pig-iron is also in poor supply. The light foundries have plenty of business on hand, and can, if home consumption is curtailed, take on export business. The general engineering and jobbing foundries, too, are well employed, much of their work being for priority contracts, but here, again, they are not getting the types of iron they would like, low- and medium-phosphorus iron being in short supply and having to be augmented with hematite and refined pig-iron. There is no improvement in the scrap situation, and supplies of both steel and cast-iron scrap are definitely short. Deliveries of coke are coming through fairly satisfactorily, and foundries are taking the opportunity of stocking supplies of ganister and limestone.

Supplies of semis are short and the prospect of sufficient quantities to meet the needs of the re-rolling trade are anything but good. Although supplies from home makers have been stepped up in recent months, they cannot produce all the billets and sheet bars which are wanted to keep the re-rollers in full operation. Imported supplies are coming through, but they are at an extremely low level. All the re-rollers are full up with orders for light sections, strip and bars, much of which is wanted for priority business. The allocations of re-rolled materials for export for Period IV are again very low. The sheet mills are well booked ahead. There is a very extensive demand for all classes of sheet, and it is very difficult for consumers to get additional orders placed even for protracted delivery. With prime billets and sheet bars in short supply, re-rollers are eager for any supplies of crops or defectives which may arise.

Shipbuilders have been given to understand that they can count on the maintenance of a fairly regular flow of steel, but in other directions there are bound to be cuts if more steel is to be diverted to the export trade.

Non-ferrous Metals

The promise made by the Minister of Fuel and Power, last week, of bigger coal supplies for industry during the coming winter is very welcome to copper and copper-alloy fabricators. Although influenced by many factors, the consumption of copper is at present basically determined by the availability of fuel and power and, even with the promised increase in coal supplies, staggering of hours and of the working load on electric power stations will still be necessary in order to achieve adequate production capacity. With the United Kingdom price of the metal still maintained well above the world level, consumers are now having to buy on a rather fuller scale than for some time past and there has been some stiffening of values in the scrap section. Fabricators still have a large volume of orders unfulfilled, although there is no doubt that a considerable export trade could be handled from a competitive point of view.

Tin producers, both in Eastern and Western hemispheres, still maintain that they should receive a higher price for the metal, but with the world shortage lessening, and the probability of production nearing the level of demand, this increase is rather uncertain. Tin supplies in the United Kingdom are sufficient for requirements, and adequate reserves are also being maintained. For some time now the demand for gunmetal and bronzes has been disappointing, and tin consumption in this direction has received a setback.

Owing to the recent shortage of pig-lead, exports have been negligible, but with the supplies of the metal increasing, due to bigger quantities of scrap and secondary metal being available, it is possible that the export trade may gradually be resumed. It must be remembered, however, that the difficulty caused by the U.K. price being consistently higher than the world level has still to be overcome from the point of view of a competitive export trade.

D.S.I.R. to Expand Activities

The Department of Scientific and Industrial Research are to take over the fundamental radio side of Telecommunications Research Establishment, the Services' biggest wartime radio station, at Malvern, to develop and use techniques for industrial purposes. Sir Edward Appleton, secretary of the Department, told the Select Committee on Estimates, whose minutes of evidence were published recently, that the establishment was too large for peacetime.

The D.S.I.R. had proposed assuming responsibility for those working on fundamental research, at a cost of £80,000 per annum, and of another group working on electronics and their applications to industry up to about £60,000 a year. Ultimately, the sections will form part of the Department's central radio-research establishment. Sir Edward said that fundamental research useful to the Mercantile Marine and to civil aviation would eventually be centralised at Malvern.

Contracts Open

The date given is the latest on which tenders will be accepted. The address is that from which forms of tender may be obtained.

St. Germans, November 5—Supplying and laying about 533 yds. of 3-in. spun-iron water main, etc., for the Rural District Council. The Council Offices, Lower Port View, Saltash. (Fee £1 1s., returnable.)

Taunton, November 5—Erection of a reinforced concrete water tower and provision and laying of 1,110 yds. of 4-in. cast-iron pipes, etc., for the Rural District Council. Ross Hooper & Harvey, engineers, 38, Market Place, Chippenham, Wilts. (Fee £1, returnable.)